## REMARKS

Upon entry of the instant amendment, claims 1, 4, 6-8, 10-11, 13-25 will remain pending in the present application. In the instant amendment, claims 1, 4, 6-8, 10, 11, 14, 15, 17 and 18 have been amended. Also, new claims 22-25 have been added.

The instant amendment made herein to the claims does not incorporate new matter into the application as originally filed. For example, regarding claim 1, the phrase "said first electrode and second electrode being applied voltages that are different from each other" is based on the paragraph [0020] at page 12 of the substitute specification filed on September 8, 2006 (hereinafter, simply referred to as the specification). The phrase "the first electrode has a plurality of gaps" is based on the paragraph [0024] at page 14 of the specification and Figs. 2, 4, 7, and 17 of the present application. The phrase "in a normal line direction of the sample attracting plane" in claims 7, 10 and 11 are based on the description at page 27, lines 10 of the specification, respectively. Further, in order to further clarify the present invention, through the claims, the phrase "the band-like comb teeth configuration" has been changed to read "the comb-like configuration," and the phrase "interelectrode" has been changed to read "inter-electrode." New claims 22 and 23 are based on paragraph [0030] at page 18 and the paragraph [0036] at page 22 of the specification, respectively. New claims 24 and 25 are based on the descriptions at page 48, line 4 and page 10, lines 12-16 of the specification, respectively.

Accordingly, proper consideration of each of the pending claims is respectfully requested at present, as is entry of the present amendment.

***Information Disclosure Statements (IDS)***

Applicants appreciate the Examiner returning the initialed PTO-1449 form submitted by Applicants on September 8, 2006.

However, Applicants note that two (2) other IDS' were filed on January 31, 2007, and January 11, 2008, respectively, and the PTO-1449 forms submitted with the IDS' were not returned with the Office Action.

Thus, the Examiner is respectfully requested to return initialed copies of the PTO-1449 to the undersigned.

***Claim Objections***

At page 2 of the outstanding Office Action, claims 1, 4, 6-8, 10-11 and 14 have been objected to because of informalities. Applicants respectfully traverse and request that the Examiner withdraw the objections based on following explanation.

*Claims 1, 4, 6-8, 10 and 11*

In the present amendment, the terms "in a depth direction" and "in the depth direction" in claims 1, 4, 6-8, 10 and 11 have been changed to read "from a side cross-sectional view" and "from the side cross-sectional view," respectively, in accordance with the Examiner's suggestion.

*Claim 7*

In the present amendment, in order to further clarify the present invention, the phrase "curb configuration" in claim 7 has been changed to read "lattice-like."

*Claim 14*

In the present amendment, in order to further clarify the present invention, the term "z" in claim 14 has been changed to read "(z)" by adding parentheses.

***Rejection under 35 U.S.C. § 112, Second Paragraph***

At page 3 of the outstanding Office Action, claims 1, 4, 6 and 14 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants respectfully traverse and request that the Examiner withdraw the rejection based on the following explanation.

*Claim 1*

Claim 1 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite because of the phrases "in the order of distance from the sample attracting plane in a depth direction of the insulating material" (the first phrase) and "in which the area that is not overlapped is crossed a plurality of times" (the second phrase). In the present amendment, in order to clarify the present invention, claim 1 has been amended to change the first phrase to read

"which are laminated in the order of distance from the sample attracting plane" and to delete the second phrase.

*Claims 4, 6 and 14*

Claims 4, 6 and 14 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite because of the phrase "the band-like comb teeth configuration."

In the present amendment, the phrase has been changed to read change "the comb-like configuration" in claims 4, 6 and 14 pursuant to the Examiner's suggestion.

***Claim Rejections under 35 U.S.C. § 103***

At pages 4-16 of the Office Action (*see paragraphs "12." to "17."*), the Examiner sets forth the following rejections:

**10.** A rejection of claims 1, 4, 6, 13, 15, 16, 20 and 21 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 (U.S. Patent No. 5,646,814) in view of Shirosaki JP '775 (JP 09-2923775 A);

**11.** A rejection of claims 7-8 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 in view of Shirosaki JP '775 and Sill U.S. '112 (U.S. Patent No. 6,431,112);

**12.** A rejection of claims 17 and 19 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 in view of Shirosaki JP '775 and Ito U.S. '521 (U.S. Publication No. 2003/0015521);

**13.** A rejection of claims 17 and 18 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 in view of Shirosaki JP '775 and Shufflebotham WO '945 (WO 97/23945);

**14.** A rejection of claim 10 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 in view of Shirosaki JP '775 and Yasushi JP '594 (JP 2004-031594);

**15.** A rejection of claim 11 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 in view of Shirosaki JP '775 and Benjamin U.S. '076 (U.S. Patent No. 6,563,076);

**16.** A rejection of claim 14 under 35 U.S.C. § 103(a) over Shamouilian U.S. '814 in view of Shirosaki JP '775 and Kitabayashi U.S. '627 (U.S. Patent No. 6,768,627);

Applicants respectfully traverse. Reconsideration and withdrawal of the rejections is requested based upon the following considerations.

*The Present Invention*

In general, electrostatic chucks can be classified into several types according to the shape of the electrode or the method to apply a voltage. Some types of electrostatic chucks will be described below with reference to figures A to C as shown in Exhibit 1, attached hereto.

First, the electrostatic chucks shown in the figures A and B each have a structure in which a voltage is applied to the electrode so as to generate a positive charge and a negative charge between the surface of the dielectric layer (insulating layer) and the substrate (wafer), and the wafer is attracted by a coulomb force (and Johnsen-Rahbek force) acting therebetween. As an example thereof, the figure A shows an electrostatic chuck called "unipolar electrostatic chuck" that applies a potential difference between the electrode and the substrate (see Exhibit 1). On the other hand, the figure B in exhibit 1 shows an electrostatic chuck called "bipolar electrostatic chuck" that applies a potential difference between two electrodes provided inside the electrostatic chuck. The electrostatic chucks shown in the figures A and B each utilize the coulomb force (and Johnsen-Rahbek force), which acts between the substrate and the electrostatic chuck. Accordingly, in the electrostatic chucks as shown in the figures A and B, it is necessary to employ a semiconductor such as a semiconductor wafer, or a conductive substrate, as the substrate to be attracted.

In view of the above, an electrostatic chuck shown in figure C of Exhibit 1 was developed to attract an electrical insulating material such as a glass substrate. The electrostatic chuck of this type is similar to the electrostatic chuck shown in figure B in that the electrodes, to each of which different voltages are applied, are employed. Meanwhile, the difference from the electrostatic chuck shown in the figure B resides in that each of the two electrodes are formed into a comb shape and the electrodes are alternately arranged with gaps. For example, through such a structure, the substrate is attracted by "uneven electric field" generated when the potential difference is applied between the electrodes. The force generated due to the "uneven electric field" is called a "gradient force." By the gradient force, not only the semiconductor wafer but also the electrical insulating material such as a glass substrate can also be attracted as long as the substrate is made of a dielectric material. Please note that, also in the electrostatic chuck shown in the figure B, it may look as if the "gradient force" is generated in each gap between the electrodes. However, the gradient force is not large enough to attract the electrical insulating material such as a glass substrate. This is because, in order to attract the electrical insulating material such as a glass substrate, it is essential that a large "gradient force" be generated over the entire surface of a sample attracting plane.

Incidentally, the above-mentioned "gradient force" can be increased by shortening the distance between the electrodes, that is, by increasing the electric field intensity. However, there arises a problem of short-circuit when the distance between the electrodes is narrowed. In the electrostatic chuck shown in the figure C in Exhibit 1, the gaps between the electrodes are usually filled with an adhesive or the like, but dielectric breakdown may occur due to voids formed when the adhesive is cured. Further, the alternately arranged electrodes are generally

formed by etching, and thus, a discharge may occur between the electrodes due to uneven etching, for example. For this reason, there is a limit in narrowing the distance between the electrodes so as to improve the electric field intensity (this point is also described in paragraphs [0004] to [0007] at pages 2-4 of the specification).

In order to solve the above-mentioned problem, provided is an electrostatic chuck of the present invention, as shown in the figure C' of Exhibit 1. (The figure C' is provided to only illustrate the present invention, not to limit the scope of the present invention.) In the present invention, two electrodes (i.e., "first electrode" and "second electrode"), to each of which different voltages are applied, are arranged in a different plane as in the conventional type, but are arranged so that the "first electrode" is disposed on a top surface of an "inter-electrode insulating layer" and the "second electrode" is disposed on the bottom surface of the "inter-electrode insulating layer" when viewed in the cross-section of the electrostatic chuck. In this case, for example, the "first electrode" (electrode positioned closer to the substrate) is formed into a comb shape with gaps so that the electric field generated between the "first electrode" and the "second electrode" reaches the substrate side. In other words, the portion corresponding to the gaps of the "first electrode" corresponds to "the area that is not overlapped with the first electrode" of the "second electrode". The "gradient force" is generated due to the "uneven electric field" generated between the "second electrode" having a plurality of "areas that are not overlapped with the first electrode" and the "first electrode," whereby the substrate is attracted. In such a structure, by use of a polyimide film having a superior insulation property as an "inter-electrode insulating layer," for example, even when the distance between the "first electrode" and the "second electrode" is narrowed, a polyimide film or the like, which is reliable in its electrical

insulation, is interposed between the "first electrode" and the "second electrode". Subsequently, short circuit between the electrodes can be avoided effectively, and a larger "gradient force" can be obtained.

*Distinctions over the Cited References*

*Shamouilian U.S. '814*

As apparent from the description in lines 9 to 16 of the second column of the Shamouilian U.S. '814 reference, the electrostatic chuck described in the cited reference corresponds to the electrostatic chuck of a type shown in the figure A (see Exhibit 1). In short, in the electrostatic chuck of Shamouilian U.S. '814, a second voltage is applied to a second electrode so as to generate a second electrostatic force, whereby the substrate is attracted to the electrostatic chuck. The second electrostatic force generated by applying a first voltage to a first electrode is utilized for attracting the electrostatic chuck to a support, and does not involve the attraction of the substrate.

Therefore, Shamouilian U.S. '814 does not give one skilled in the art any motivation to arrive at the present invention.

*Shirosaki JP '775*

The electrostatic chuck described in the Shirosaki JP '775 reference also corresponds to the electrostatic chuck of the type shown in the figure A of Exhibit 1.

As shown in Fig. 1 of Shirosaki JP '775, the electrostatic chuck thereof has three electrode plates (46, 48, and 50) each having a different distance from a wafer attracting surface,

inside a dielectric material 42. Regarding reasons why such a structure is employed, Shirosaki JP '775 describes, as follows:

> *"The temperature of the dielectric material 42 is changed so as to change the temperature of the wafer, and the electrodes are switched so as to substantially offset a variation in electrostatic force of the wafer due to the temperature change."* (Abstract)

Further, Shirosaki JP '775 disclose, as follows:

> *"However, when the wafer is heated or cooled through the dielectric material so as to control the temperature of the wafer, there arises a problem in that the electrostatic force of the electrostatic chuck fluctuates, thereby making it impossible to attract the wafer in the predetermined manner. More specifically, as shown in Fig. 4, a He gas pressure on the back surface of the wafer is reduced in accordance with the reduction in wafer temperature. This is because it is assumed that, when the wafer temperature is reduced, the electrostatic force of the electrostatic chuck is reduced, with the result that an He gas flows from a gap between the wafer back surface and the wafer attracting surface, and the He gas pressure on the wafer back surface is reduced."* (The paragraph [0005] of the Shirosaki JP '775 reference)

In view of such reasons, the electrostatic chuck of Shirosaki JP '775 has the structure as described in the paragraph [0009] thereof:

> *"In the electrostatic chuck according to the present invention, the electrode is selected and the thickness of the dielectric material interposed between the electrode and the wafer is changed so as to increase or decrease the coulomb force, to thereby adjust the electrostatic force to be kept constant. Further, when the thickness of the dielectric material is changed, the value of the*

*current flowing through the dielectric material also fluctuates, whereby a Johnsen-Rahbek force Fir fluctuates."*

Accordingly, the electrostatic chuck described in the cited reference corresponds to the electrostatic chuck of figure A (or modified type thereof at best). The cited reference does not teach that the "first electrode" is disposed on the top surface of the "inter-electrode insulating layer" and the "second electrode" is disposed on the bottom surface of the "inter-electrode insulating layer." Therefore, Shirosaki JP '775 does not give one skilled in the art any motivation to arrive at the present invention.

*Sill U.S. '112*

As apparent from, for example, Fig. 1, the electrostatic chuck described in the Sill U.S. '112 reference is a bipolar electrostatic chuck having electrodes 44 and 46, and is classified as the electrostatic chuck of figure B (see Exhibit 1). Accordingly, the cited reference does not disclose or teach the electrostatic chuck of a type utilizing the "gradient force" as shown in figure C (and the electrostatic chuck of the present invention as shown in the figure C').

Therefore, Sill U.S. '112 does not give one skilled in the art any motivation to arrive at the present invention.

*Ito U.S. '521*

First, Ito U.S. '521 is non-analogous art to the present invention since an invention of Ito U.S. '521 relates to not an electrostatic chuck but a ceramic heater having heat generation bodies within a ceramic substrate.

Furthermore, even if an electrostatic chuck is disclosed therein, a structure of Ito U.S. '521 is different from a structure of the present invention. In paragraphs [0112] and [0113] of the Ito U.S. '521 reference, it is disclosed that a comb-tooth electrode 52 is printed by the application of a conductive paste in the ceramic substrate, thereby making it possible to form an electrostatic chuck. Further, Fig. 10 thereof shows the shape of the electrode. However, even though the electrostatic chuck is disclosed therein, such an electrostatic chuck, at best, corresponds to a conventional one as shown in the figure C of Exhibit 1.

Thus, the cited reference does not disclose or teach the electrostatic chuck having the structure in which the "first electrode" is disposed on the top surface of the "inter-electrode insulating layer" and the "second electrode" is disposed on the bottom surface of the "inter-electrode insulating layer". Accordingly, Ito U.S. '521 does not give one skilled in the art any motivation to arrive at the present invention.

*Shufflebotham WO '945*

As shown in Fig. 1 of the Shufflebotham WO '945 reference, the electrostatic chuck of the cited reference is the type shown in the figure C of Exhibit 1. Incidentally, this reference is cited in the specification of the present invention. (See paragraph [0005] of the specification. JP 2000-502509 described therein corresponds to the Shufflebotham WO '945 reference.)

*Yasushi JP '594*

The cited reference discloses an electrostatic chuck having an annular electrode 5 isolated on the outside of attraction electrodes 4a and 4b. As apparent from Figs. 1 and 2 and the

description at paragraph [0020] (e.g., "in order to increase the electrostatic force between the annular electrode 5 and the wafer W, it is preferable that the annular electrode 5 and the attraction electrodes 4 be disposed at the same distance from the mounting surface 3 of the plate-like ceramic body 2"), those electrodes 4a and 4b are each disposed in the same plane. Thus, the Yasushi JP '594 reference merely discloses the electrostatic chuck of the type shown in the accompanying figure B or C, at best.

Accordingly, Yasushi JP '594 does not give one skilled in the art any motivation to arrive at the present invention.

*Benjamin U.S. '076*

Fig. 1C of the Benjamin U.S. '076 reference shows the plan view of a portion corresponding to an electrostatic chuck 36 provided in a plasma reactor shown in Fig. 1 B. In short, the electrostatic chuck described in the cited reference corresponds to the electrostatic chuck of the type shown in figure B in Exhibit 1. Thus, Benjamin U.S. '076 fails to disclose or suggest the present invention, since the cited reference does not teach the electrostatic chuck of the type utilizing the "gradient force" as shown in the figure C in Exhibit 1 (and the electrostatic chuck of the present invention as shown in the figure C').

Accordingly, Benjamin U.S. '076 does not give one skilled in the art any motivation to arrive at the present invention.

*Kitabayashi U.S. '627*

As apparent from Figs. 4 to 6 of the Kitabayashi U.S. '627 reference, the electrostatic chuck described in the cited reference corresponds to the electrostatic chuck of the type shown in the accompanying figure C. Thus, Kitabayashi U.S. '627 fails to disclose or suggest the present invention, since the cited reference does not disclose or teach the electrostatic chuck having the structure in which the "first electrode" is disposed on the top surface of the "inter-electrode insulating layer" and the "second electrode" is disposed on the bottom surface of the "inter-electrode insulating layer".

Accordingly, Kitabayashi U.S. '627 does not give one skilled in the art any motivation to arrive at the present invention.

*U.S. 2002/0109955 (filed with IDS dated January 11, 2008)*

U.S. Patent Application Publication No. 2002/0109955 was listed on the PTO-1449 form submitted with the IDS dated January 11, 2008. For the Examiner's convenience, the comments regarding the reference would be provided below.

Fig. 1 of the reference shows an electrostatic chuck in which electrodes 3 are disposed on the top and bottom surfaces of an insulating base material in which the periphery of a graphite substrate 1 is covered with an insulating layer 2. However, the reference merely describes that "[a]lthough not shown in FIG. 1, opposite ends of the electrode 3 are respectively connected to terminals, which in turn are connected to a power source" (see paragraph [0003]), but fails to disclose or suggest a specific method to apply voltage. Further, as apparent from the description "a source of voltage is applied across the electrodes to generate a Coulomb force, the work piece

5 is electrostatically attracted or clamped to the chucking surface" in paragraph [0004], and the description "[t]he coating 4 having such a range of which greatly increases the chucking force as known in the art as the "Johnsen-Rahbek" effect" in paragraph [0006], the electrostatic chuck described in the reference corresponds to the electrostatic chuck of the type shown in the accompanying figure B (or A). In addition, in paragraph [0032], the reference describes that "[a] 10 mm thick of graphite substrate was coated with."

However, it is impossible that the "gradient force" is generated from the electrodes disposed on the top and bottom surfaces of the graphite plate having at least the above-mentioned thickness to thereby attract the substrate.

Accordingly, U.S. Patent Application Publication No. 2002/0109955 does not give one skilled in the art any motivation to arrive at the present invention.

*Combinations of the cited references*

As explained above, none of the cited references disclose or suggest the specific structure of a bipolar electrostatic chuck of the present invention. Thus, a *prima facie* case of obviousness is not established even if the cited references are combined. Likewise, it follows that a person having ordinary skill in the art would not be motivated by any of the teachings of the cited references and by general knowledge to arrive at the present invention.

By employment of the specific structure of the electrostatic chuck of the present invention, the larger electrostatic force can be obtained while the fear of short-circuit between electrodes is reduced effectively. Results of the calculation model show that the electrostatic chuck of the present invention has an electrostatic force about four times as large as that of the

electrostatic chuck of the conventional type shown in the figure C (see paragraphs [0060] to [0062] at pages 44-45 of the specification).

In view of the foregoing, the claimed electrostatic chuck is clearly distinguished from and further, not obvious over the cited references. Furthermore, the electrostatic chuck of the present invention exhibits specific excellent effects that are not expected from any of the cited references.

Based on the foregoing explanation, Applicants respectfully request that the Examiner withdraw the rejections.

## CONCLUSION

Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that each of the pending claims are allowed.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Toyohiko Konno (Reg. No. L0053) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§ 1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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Attachment: Exhibit 1



GMM/TK/kam